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(71) Applicant
Kenneth Donald Kloster,
6649 Millridge, Maumee,
Ohio 43537, United
States of America
(72) Inventor
Kenneth Donald Kloster
(74) Agent and/or Address for
Service
R. G. C. Jenkins and Co.,
12/15 Fetter Lane,
London EC4A 1PL

(54) **Helical spring compressor**

(57) The compressor comprises a pair of spaced apart shoes 12, 14 each having a helical groove 18 formed therein for engaging a portion of the coil of the spring. Each shoe also includes a latchable locking device 20, 22 extendable over the respective helical groove for maintaining the coil of the spring within the groove during the compression operation. The two shoes are maintained in a spaced apart relationship with the associated grooves in facing relation to one another by means of a threaded shank member 16. The threaded shank member is employed to effect movement of the spaced apart shoes toward and away from one another during the operation of the tool.

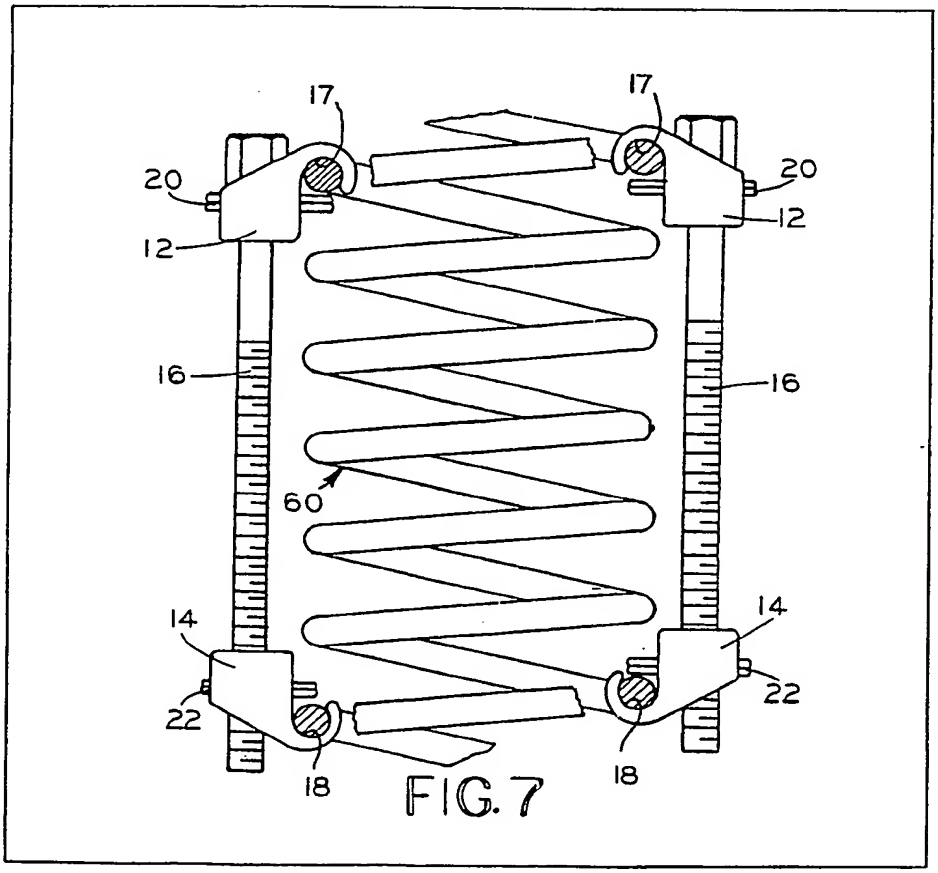

FIG. 7

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This print takes account of replacement documents later filed to enable the application to comply with the formal requirements of the Patents Rules 1978.

SPECIFICATION
Spring compressor

One type of vehicle suspension system which is becoming increasingly popular is the MacPherson strut suspension system. The MacPherson strut is an integral coil spring-shock absorber assembly which provides a lightweight, compact vehicle suspension system. The MacPherson strut suspension system is disclosed in more detail in United States Patent No. 2,624,592 to E.S. MacPherson.

One of the problems associated with the MacPherson strut assembly is that the shock absorber unit typically wears out before the associated coil spring. One solution to this problem is to manufacture the MacPherson strut assembly with a construction which permits the shock absorber to be readily removed and replaced with a new shock absorber. However, such a repair procedure can be relatively time consuming, since typically the strut assembly must be removed from the vehicle.

One solution to reducing the time associated with repairing a MacPherson strut assembly is disclosed in United States Patent No. 4,034,960 to K.D. Kloster. The Kloster patent discloses a pneumatic operated spring compressor which can be utilized to repair a strut assembly while the lower portion of the assembly remains attached to the vehicle. However, the economics of such a compressor can typically only be justified by repair shops which frequently repair strut suspension systems.

Smaller repair shops typically utilize a relatively inexpensive spring compressor unit of the type manufactured by Warren, Inc. of Jonesboro, Arkansas. This type of spring includes a pair of spaced apart U-shaped hooks which are maintained in a facing relation by means of an elongate bolt. In operation, typically two or three of the compressor units are circumferentially spaced about the coil spring and the bolts are alternately tightened to move the U-shaped hooks towards one another, thereby compressing the spring. However, one of the problems associated with this type of spring compressor is that the U-shaped hooks do not provide a good seating relationship with the helical coil of the spring which may lead to twisting and misalignment of the spring compressor. Such twisting or misalignment may result in the dangerous condition of causing the compressor hooks to become dislodged from the spring and inflict injury upon the operator.

The present invention relates to a tool for compressing the helical spring of the type typically utilized in a MacPherson strut suspension system. The tool comprises a pair of spaced apart shoes each having a helical groove formed therein for engaging a portion of the coil of the spring. Such an arrangement includes a shoe having a bearing surface in contact with the spring coil which tends to militate against any twisting or misalignment of the spring compressor during the compression operation. Each shoe also includes a latchable locking means extendible over the helical groove for maintaining the coil of the spring within the groove during the compression operation. Consequently, even if the shoe would become misaligned, the latchable locking means prevents the spring compressor from becoming dislodged from the spring.

The pair of shoes are maintained in a spaced apart relationship with the associated grooves in facing relation to one another by means of a threaded shank member. The threaded shank member is employed to effect movement of the spaced apart shoes toward and away from one another during the operation of the tool.

Accordingly, it is an object of the present invention to provide a relatively economical spring compressor which can effectively and safely be employed to compress a helical coil spring.

The above, as well as other objects and advantages of the invention, will become readily apparent to one skilled in the art of reading the following detailed description of the invention when considered in light of the accompanying drawings, in which:

Figure 1 is a perspective view of a spring compressor embodying the features of the present invention;

Figure 2 is a rear elevational view of the lower shoe of the compressor of Figure 1;

Figure 3 is a side elevational view of the shoe shown in Figure 2;

Figure 4 is a sectional view taken along the line 4—4 of Figure 3;

Figure 5 is a top elevational view of the shoe shown in Figure 3;

Figure 6 is a sectional view taken along the line 6—6 of Figure 5; and

Figure 7 is an elevational view of a helical coil spring having a pair of spring compressors according to the present invention positioned thereon.

Referring to Figure 1, there is shown a spring compressor generally indicated by reference numeral 10 embodying the features of the present invention. The compressor 10 includes an upper shoe 12 and a lower shoe 14 which are maintained in a spaced apart relationship by an elongate threaded shank 16. The shoes 12 and 14 have helical grooves 17 and 18 formed therein for receiving a portion of the coil spring to be compressed. The shoes 12 and 14 also have latchable locking means 20 and 22, respectively, mounted thereon which are extendible to a locked position across the respective grooves to maintain the coil within the groove during the compression operation. The locking means can be moved to a retracted position when it is desired to remove the coil from the associated groove.

Referring to Figures 2 through 6, there are shown more detailed drawings illustrating the features of the lower shoe unit 14. Except for an internally threaded bushing 24 which is centrally located within the shoe 14 to receive the one end of the threaded shank 16, the shoe 14 is basically

identical to the upper shoe 12. Both shoes can be, for example, aluminum castings.

As previously mentioned, the groove 18 is formed with a helical configuration. This type of construction provides an increased bearing surface for engagement with the coil of the spring, thereby militating against any twisting of the shoe 14 during the compression of the spring As shown in Figures 3 through 5, the groove 18 is defined by arcuately formed sidewalls 26 and 28 and a lower inclined surface 30. As shown in Figure 4, the lower inclined surface 30 is formed at an angle A with respect to a plane perpendicular with the longitudinal axis of the threaded shank 16. It has been found that an angle A of approximately 7° provides a medium angle which accommodates most large helical springs. The sidewalls 26 and 28 of the groove 18 are arcuately formed and spaced apart sufficiently so as to encompass the expected size ranges of springs. The groove 17 of the upper shoe 12 is formed in a similar manner to the groove 18.

The latchable locking means 22 includes a U-shaped member 32 formed from a steel rod and having a pair of parallel legs 34 and 36 which extend into parallel apertures 38 and 40, respectively, formed in the shoe 14. As shown in Figure 4, the apertures 38 and 40 are formed at the same angle A as the groove 18. The U-shaped member 32 is maintained in either a locked or retracted position by means of a pair of detent assemblies 42 and 44 located in parallel apertures 46 and 48 formed in the shoe 14. The apertures 46 and 48 are pependicular to and intersect the apertures 38 and 40, respectively.

As shown in Figure 6, the detent assembly 44 includes a ball 50, a spring 52, and a locking washer 54, which are mounted within the aperture 48. The spring 52 urges the ball 50 downwardly into either a locking detent 56 or a retracted detent 58 formed in the leg 36. The detent assembly 42 and the detents formed in the leg 34 are similar to those associated with leg 36. The latchable locking means 20 of the upper shoe 12 is similar to the locking means 22.

When the U-shaped member 32 is pushed inwardly, as shown in Figure 5, the legs 34 and 36 will protrude from the apertures 38 and 40, respectively, and extend outwardly across the top of the groove 18. At this time, the ball 50 will be seated within the detent 56 to maintain the locking member 32 in the locked position. The locking member 32 can be moved to a retracted position, as illustrated in phantom in Figure 5, by pulling outwardly on the member 32 such that the ball 50 will be momentarily moved upward and then seat within the detent 58.

Figure 7 illustrates the general operational position of the spring compressing tool 10. Typically, at least two sping compressors 10 are utilized to compress a single coil spring 60. In positioning the compressors 10 on the spring 60, the locking means 20 and 22 are moved ot the retracted position while the end coils of the spring 60 are seated within the grooves 17 and 18. Next, the locking means 20 and 22 are moved to the locked position in order to secure the shoes 12 and 14 to the coil. A suitable wrench can then be utilized to alternately rotate the bolts 16 to cause the lower and uppershoes to move toward one another, thereby compressing the spring 60. As previously mentioned, the helical grooves 17 and 18 tend to militate against any twisting of the compressor 10 during the compression operation, while the locking means 20 and 22 will prevent the compressor 10 from being dislodged from the spring.

In accordance with the provisions of the patent statutes, the principle and mode of operation of the invention have been explained in what is considered to represent its best embodiment. It should, however, be understood that the invention may be practiced otherwise than as specifically illustrated and described without departing from its spirit or scope.

CLAIMS

1. An apparatus for comprising a helical coil spring comprising:

a pair of spaced apart shoes each having a groove formed therein for receiving a portion of the helical coil of the spring, at least one of said shoes including a latchable locking means extendable over said groove for maintaining the portion of the helical coil within said groove;

means for mounting said shoes in a spaced apart arrangement with said grooves in facing relation to one another; and

means for moving said shoes toward and away from one another.

2. An apparatus according to claim 1 wherein said grooves are formed of a helical configuration.

3. An apparatus according to claim 1 wherein said latchable locking means includes a U-shaped member having a pair of spaced apart parallel legs extending through apertures formed in said shoe, said U-shaped member movable from a locked position wherein the outer ends of said legs extend over said groove to a retracted position wherein said legs are positioned within said shoe.

4. An apparatus according to claim 3 wherein said latchable locking means includes detent means for maintaining said U-shaped member in either the locked position or the retracted position.

5. An apparatus according to claim 1 wherein said means for mounting said shoes is an elongate shank.

6. An apparatus according to claim 5 wherein said means for moving said shoes includes external threads formed on one end of said shank engageable with internal threads formed in one of said shoes.

7. An apparatus for compressing a helical coil spring comprising:

a pair of spaced apart shoes each having a helical-shaped groove formed therein for receiving a portion of the helical coil of the spring; and

an elongate shank for mounting said shoes in a

spaced apart arrangement with said grooves in facing relation to one another, said shank having external threads formed on one end thereof and cooperating with internal threads formed in one of said shoes for moving said shoes toward and away from one another.

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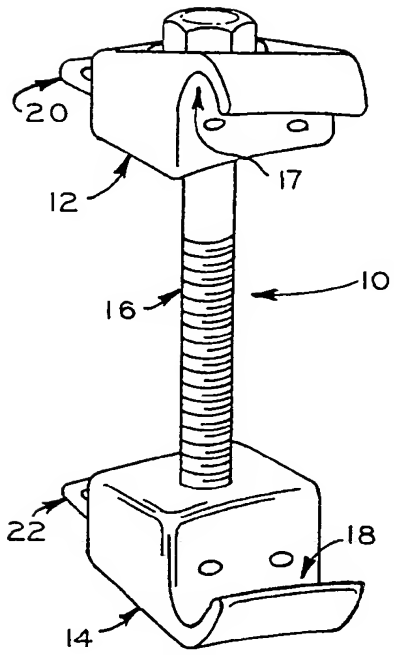

FIG.1

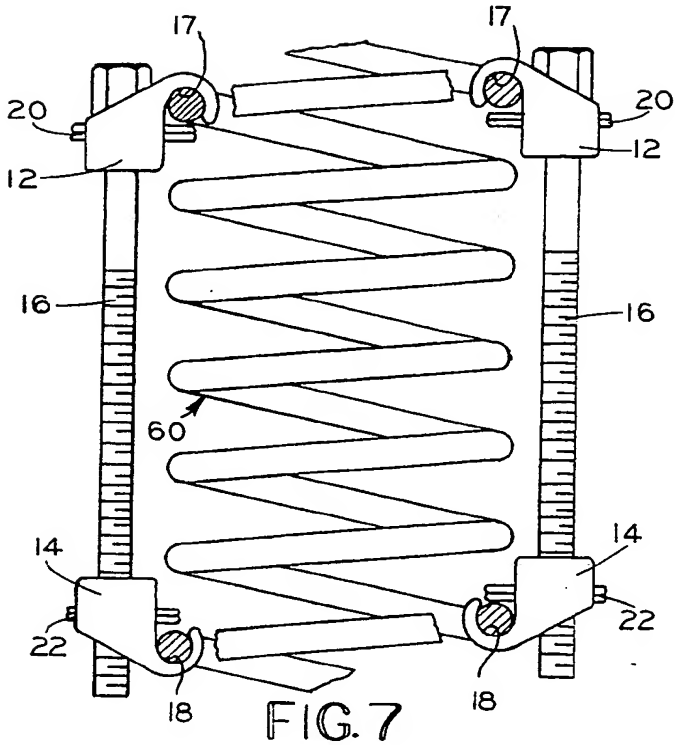

FIG.7

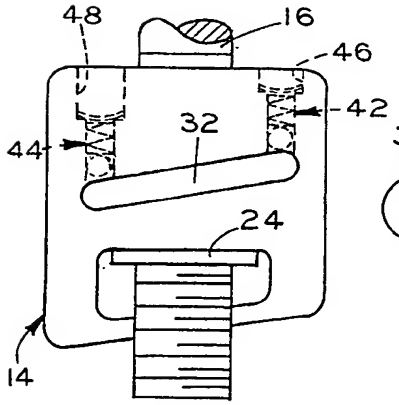

FIG.2

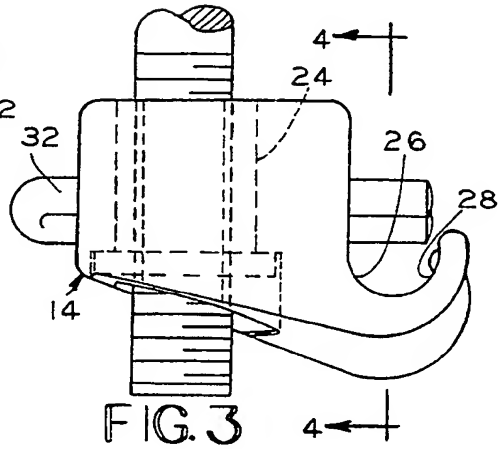

FIG.3

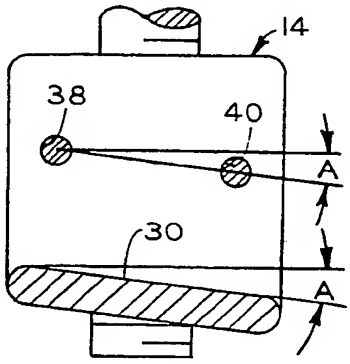

FIG.4

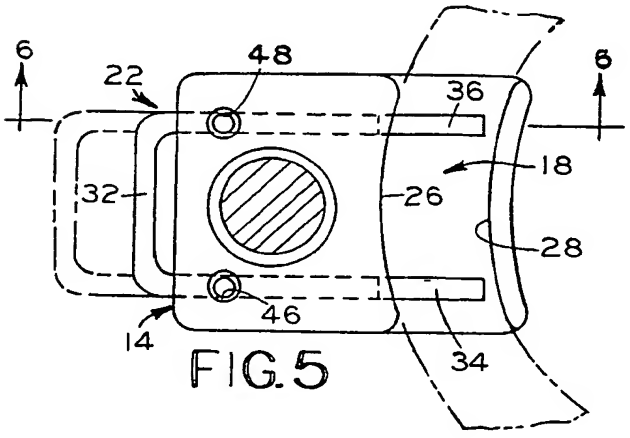

FIG.5

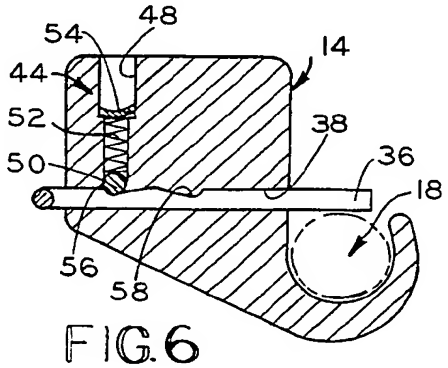

FIG.6